

74LCX00

Low Voltage Quad 2-Input NAND Gate with 5V Tolerant Inputs

Features

- 5V tolerant inputs
- 2.3V–3.6V V_{CC} specifications provided
- 5.2ns t_{PD} max. ($V_{CC} = 3.3V$), 10 μ A I_{CC} max.
- Power down high impedance inputs and outputs
- $\pm 24mA$ output drive ($V_{CC} = 3.0V$)
- Implements proprietary noise/EMI reduction circuitry
- Latch-up performance exceeds JEDEC 78 conditions
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V
- Leadless DQFN package

General Description

The LCX00 contains four 2-input NAND gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX00 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Ordering Information

Order Number	Package Number	Package Description
74LCX00M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX00SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX00BQX ⁽¹⁾	MLP14A	14-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.0mm
74LCX00MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Note:

1. DQFN package available in Tape and Reel only.

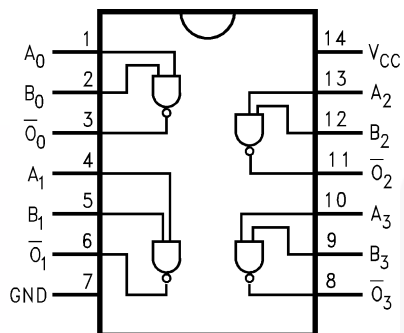
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.



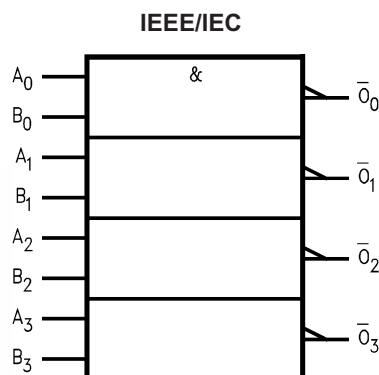
All packages are lead free per JEDEC: J-STD-020B standard.

Connection Diagrams

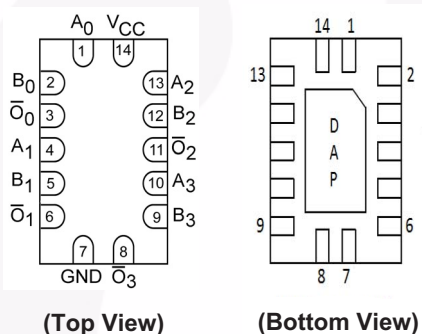
Pin Assignments for SOIC, SOP, and TSSOP



Logic Symbol



Pad Assignments for DQFN



Pin Description

Pin Names	Description
A_n, B_n	Inputs
$\bar{O}_n$	Outputs
DAP	No Connect

Note: DAP (Die Attach Pad)

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	−0.5V to +7.0V
V_I	DC Input Voltage	−0.5V to +7.0V
V_O	DC Output Voltage, Output in HIGH or LOW State ⁽²⁾	−0.5V to $V_{CC} + 0.5V$
I_{IK}	DC Input Diode Current, $V_I < GND$	−50mA
I_{OK}	DC Output Diode Current $V_O < GND$	−50mA
	$V_O > V_{CC}$	+50mA
I_O	DC Output Source/Sink Current	±50mA
I_{CC}	DC Supply Current per Supply Pin	±100mA
I_{GND}	DC Ground Current per Ground Pin	±100mA
T_{STG}	Storage Temperature	−65°C to +150°C

Note:

2. I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions⁽³⁾

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min.	Max.	Units
V_{CC}	Supply Voltage Operating	2.0	3.6	V
	Data Retention	1.5	3.6	
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage, HIGH or LOW State	0	V_{CC}	V
I_{OH} / I_{OL}	Output Current $V_{CC} = 3.0V-3.6V$		±24	mA
	$V_{CC} = 2.7V-3.0V$		±12	
	$V_{CC} = 2.3V-2.7V$		±8	
T_A	Free-Air Operating Temperature	−40	85	°C
$\Delta t / \Delta V$	Input Edge Rate, $V_{IN} = 0.8V-2.0V$, $V_{CC} = 3.0V$	0	10	ns/V

Note:

3. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = -40°C to +85°C		Units
				Min.	Max.	
V _{IH}	HIGH Level Input Voltage	2.3–2.7		1.7		V
		2.7–3.6		2.0		
V _{IL}	LOW Level Input Voltage	2.3–2.7			0.7	V
		2.7–3.6			0.8	
V _{OH}	HIGH Level Output Voltage	2.3–3.6	I _{OH} = -100μA	V _{CC} - 0.2		V
		2.3	I _{OH} = -8mA	1.8		
		2.7	I _{OH} = -12mA	2.2		
		3.0	I _{OH} = -18mA	2.4		
			I _{OH} = -24mA	2.2		
V _{OL}	LOW Level Output Voltage	2.3–3.6	I _{OL} = 100μA		0.2	V
		2.3	I _{OL} = 8mA		0.6	
		2.7	I _{OL} = 12mA		0.4	
		3.0	I _{OL} = 16mA		0.4	
			I _{OL} = 24mA		0.55	
I _I	Input Leakage Current	2.3–3.6	0 ≤ V _I ≤ 5.5V		±5.0	μA
I _{OFF}	Power-Off Leakage Current	0	V _I or V _O = 5.5V		10	μA
I _{CC}	Quiescent Supply Current	2.3–3.6	V _I = V _{CC} or GND		10	μA
			3.6V ≤ V _I ≤ 5.5V		±10	
ΔI _{CC}	Increase in I _{CC} per Input	2.3–3.6	V _{IH} = V _{CC} - 0.6V		500	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = −40°C to +85°C, R _L = 500Ω						Units
		V _{CC} = 3.3V ± 0.3V, C _L = 50pF		V _{CC} = 2.7V, C _L = 50pF		V _{CC} = 2.5V ± 0.2V, C _L = 30pF		
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{PHL} , t _{PLH}	Propagation Delay	1.5	5.2	1.5	6.0	1.5	6.2	ns
t _{OSHL} , t _{OSLH}	Output to Output Skew ⁽⁴⁾		1.0					ns

Note:

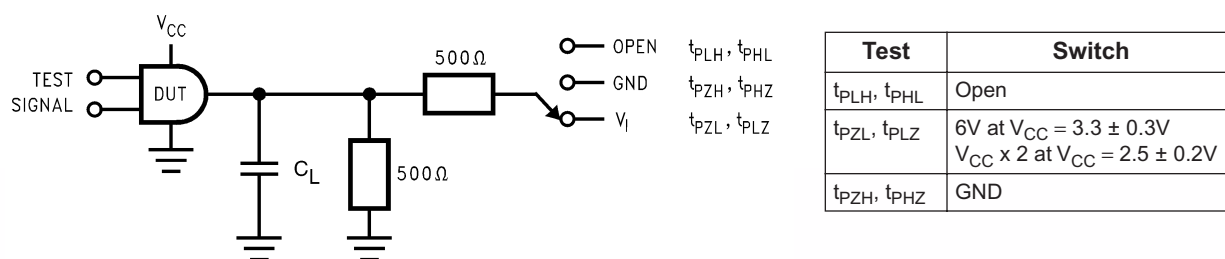
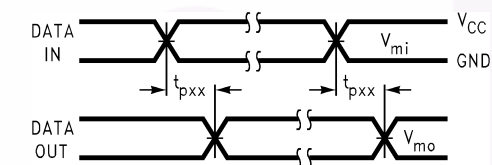
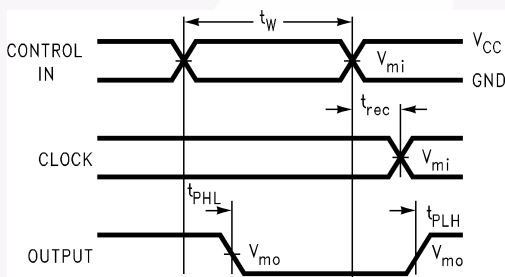
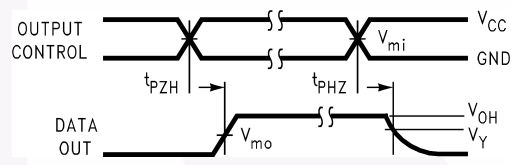
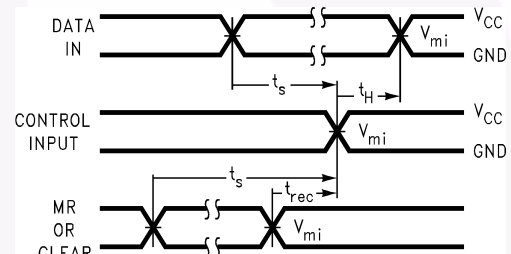
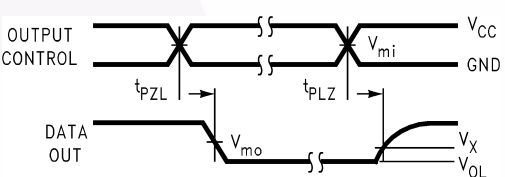
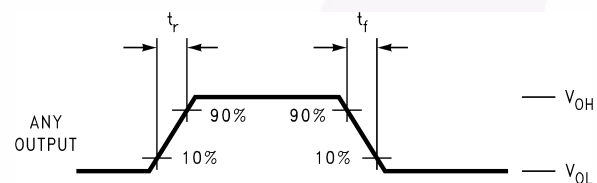
4. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

Dynamic Switching Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	$T_A = 25^\circ\text{C}$	Unit
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	3.3	$C_L = 50\text{pF}$, $V_{IH} = 3.3\text{V}$, $V_{IL} = 0\text{V}$	0.8	V
		2.5	$C_L = 30\text{pF}$, $V_{IH} = 2.5\text{V}$, $V_{IL} = 0\text{V}$	0.6	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	3.3	$C_L = 50\text{pF}$, $V_{IH} = 3.3\text{V}$, $V_{IL} = 0\text{V}$	-0.8	V
		2.5	$C_L = 30\text{pF}$, $V_{IH} = 2.5\text{V}$, $V_{IL} = 0\text{V}$	-0.6	

Capacitance

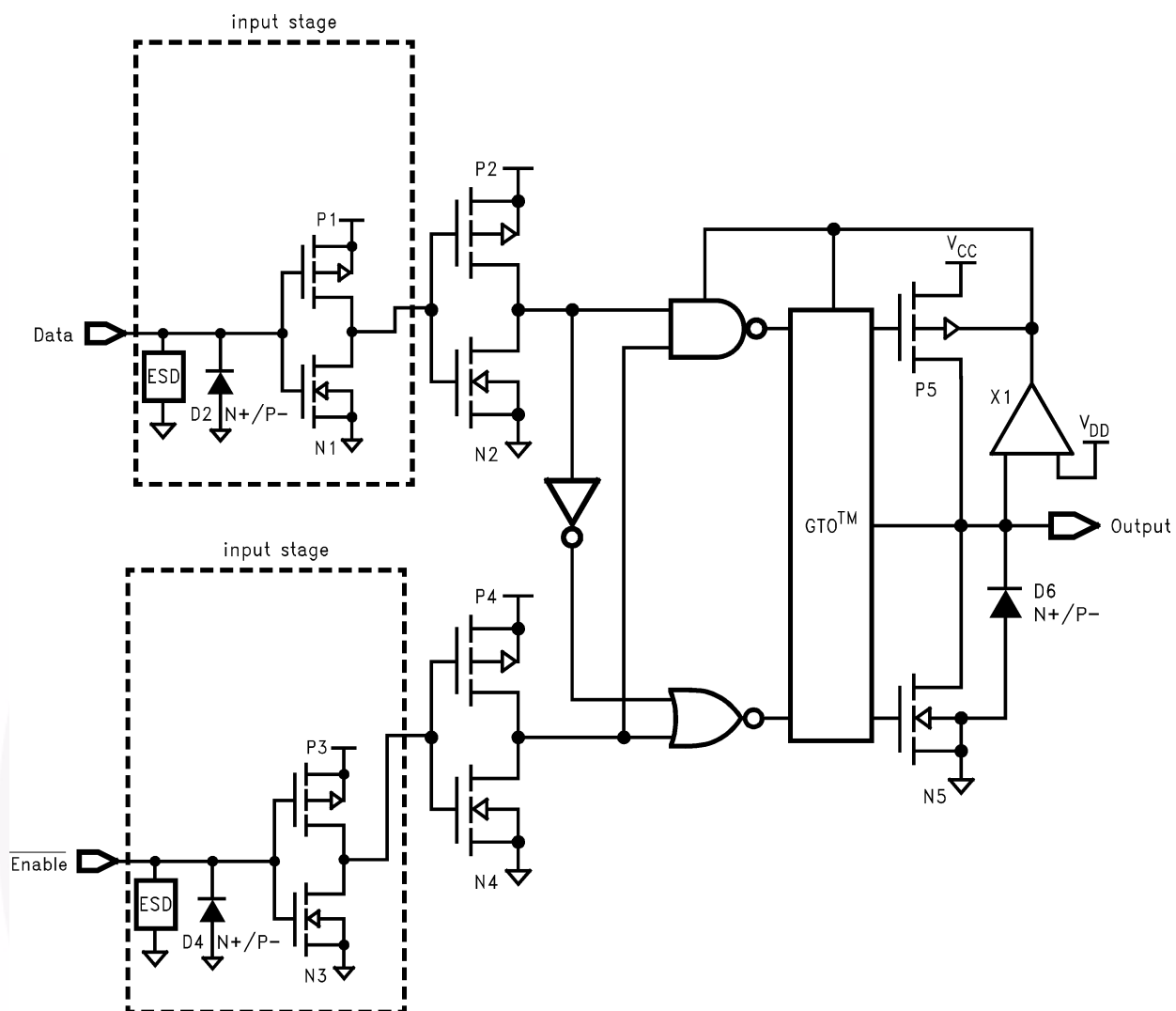
Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}$, $V_I = 0\text{V}$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3\text{V}$, $V_I = 0\text{V}$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}$, $V_I = 0\text{V}$ or V_{CC} , $f = 10\text{MHz}$	25	pF

AC Loading and Waveforms (Generic for LCX Family)Figure 1. AC Test Circuit (C_L includes probe and jig capacitance)**Waveform for Inverting and Non-Inverting Functions****3-STATE Output High Enable and Disable Times for Logic****Propagation Delay, Pulse Width and t_{rec} Waveforms****Setup Time, Hold Time and Recovery Time for Logic****3-STATE Output Low Enable and Disable Times for Logic** t_{rise} and t_{fall}

Symbol	V_{CC}		
	$3.3V \pm 0.3V$	$2.7V$	$2.5V \pm 0.2V$
V_{mi}	1.5V	1.5V	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$
V_x	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
V_y	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

Figure 2. Waveforms (Input Characteristics; $f = 1MHz$, $t_r = t_f = 3ns$)

Schematic Diagram (Generic for LCX Family)

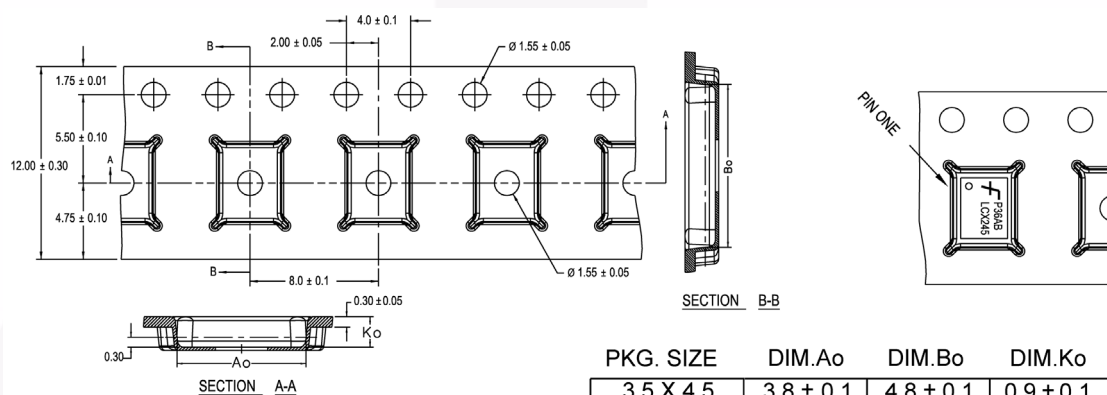


Tape and Reel Specification

Tape Format for DQFN

Package Designator	Tape Section	Number of Cavities	Cavity Status	Cover Tape Status
BQX	Leader (Start End)	125 (Typ.)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typ.)	Empty	Sealed

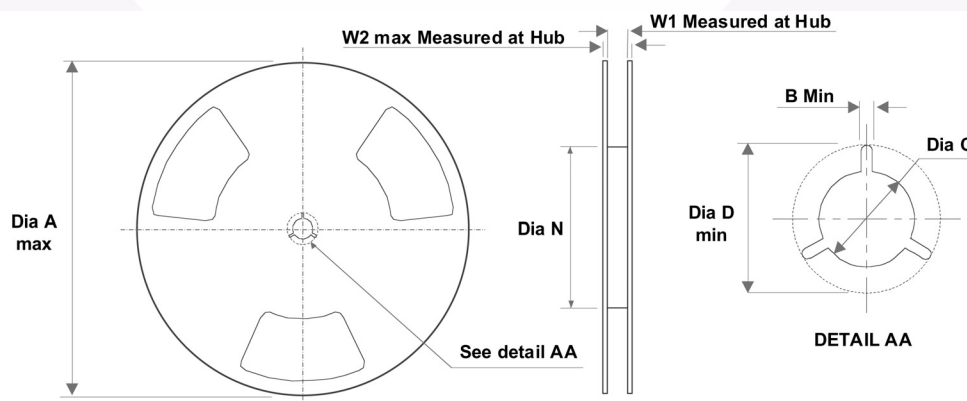
Tape Dimensions inches (millimeters)



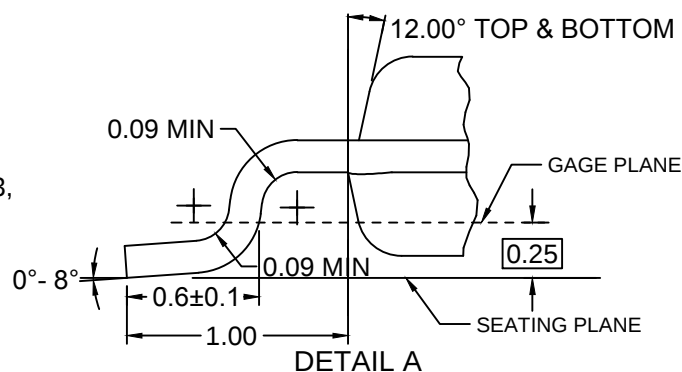
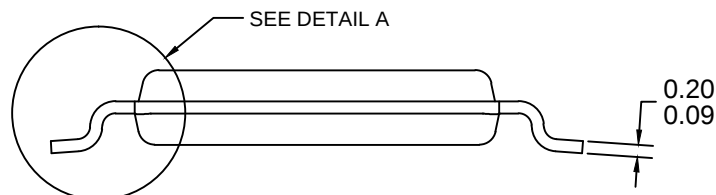
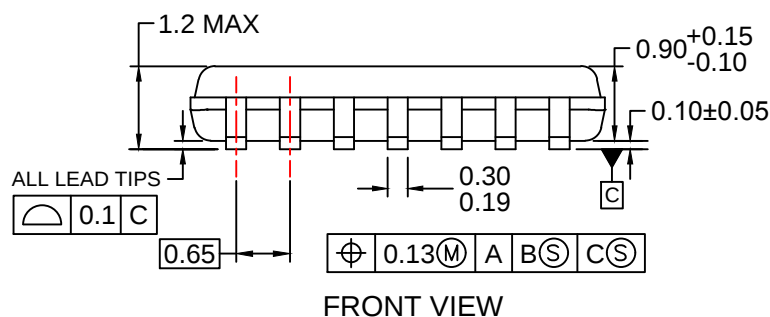
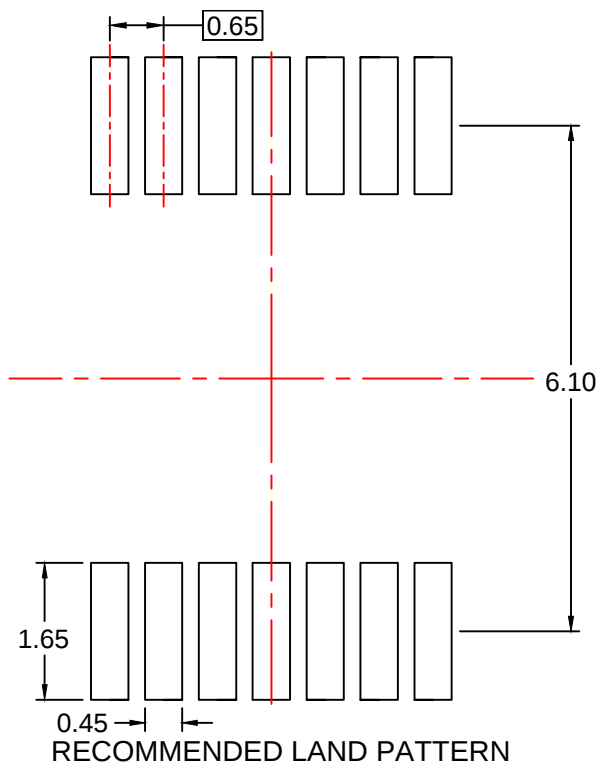
NOTES: unless otherwise specified

1. Cumulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is $\pm 0.002[0.05]$ for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Dimension in inches rounded.

Reel Dimensions inches (millimeters)



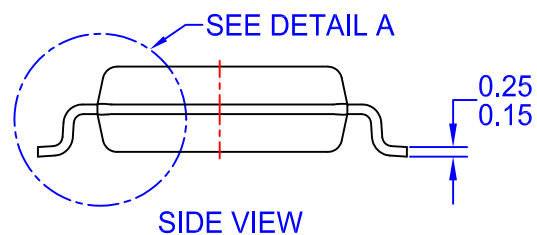
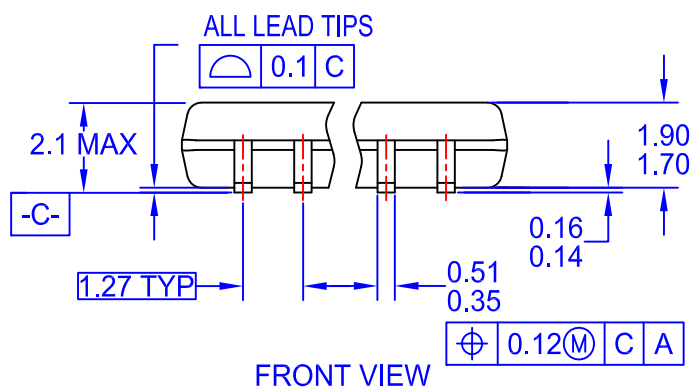
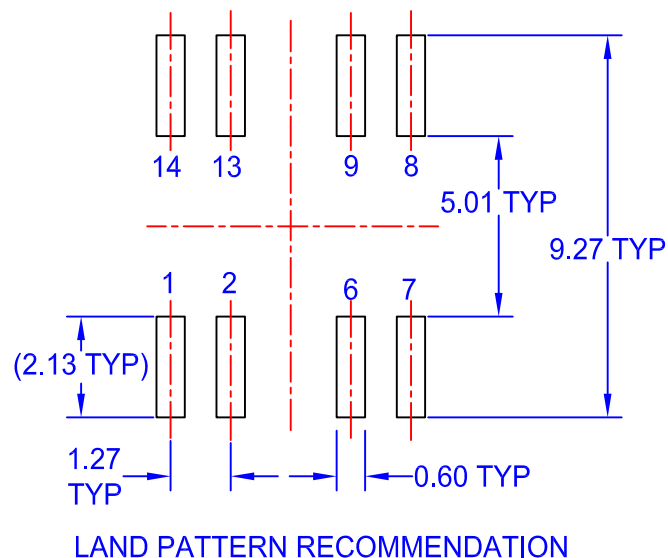
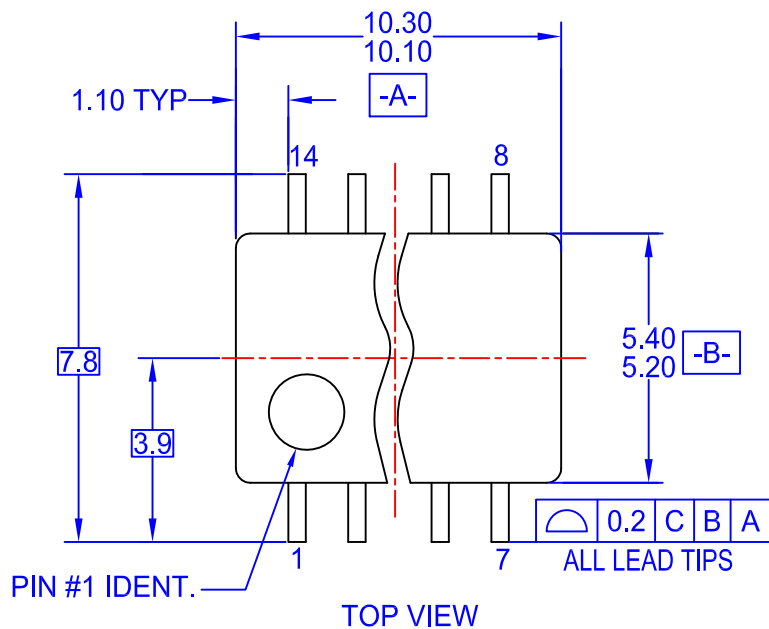
Tape Size	A	B	C	D	N	W1	W2
12mm	13.0 (330.0)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.488 (12.4)	0.724 (18.4)



NOTES:

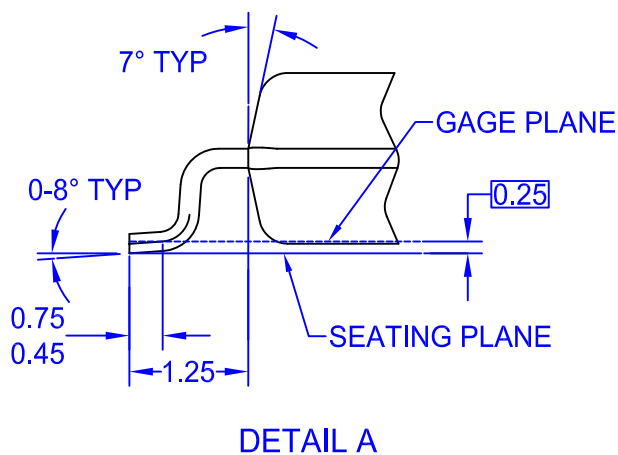
- CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 2009.
- LANDPATTERN STANDARD: SOP65P640X110-14M.
- DRAWING FILE NAME: MKT-MTC14rev7.

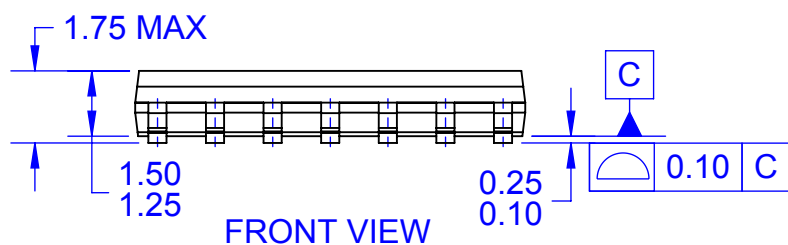




NOTES:

- CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- DRAWING FILENAME: MKT-M14Drev4.





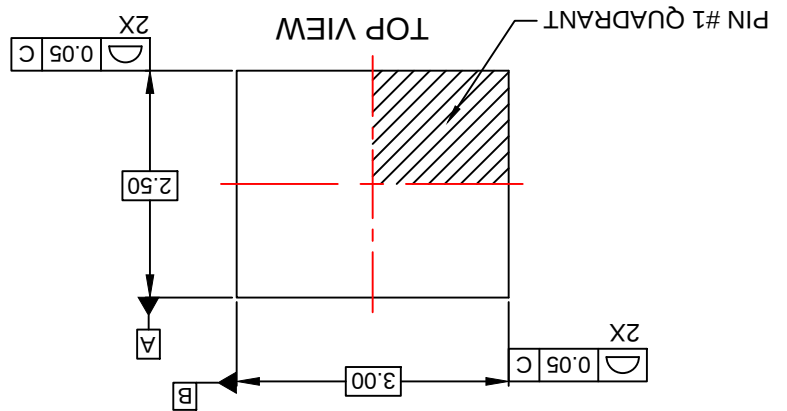
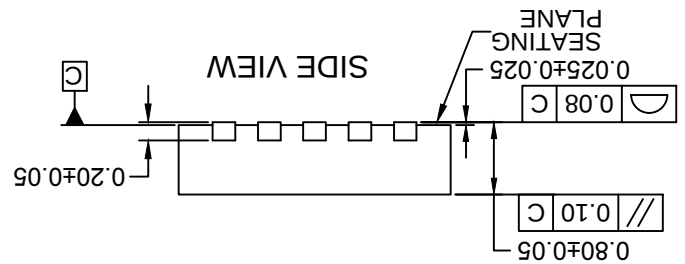
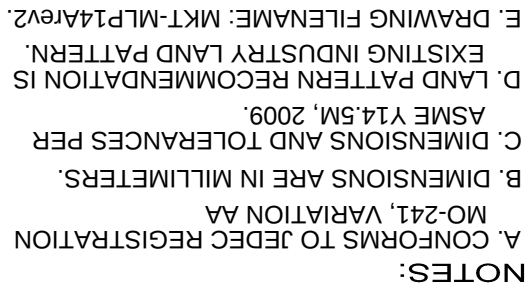
NOTES:

- A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
- D. LAND PATTERN STANDARD: SOIC127P600X145-14M
- E. CONFORMS TO ASME Y14.5M, 2009
- D. DRAWING FILENAME: MKT-M14Arev14



DETAIL A
SCALE 16 : 1





ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative